

REMARKS

Applicants appreciate the detailed examination evidenced by the Office Action mailed March 23, 2006 (hereinafter "Office Action"), and more particularly, the indication that Claims 3 and 15 recite patentable subject matter. Applicants have canceled Claim 9 to reduce the issues under consideration. In response to the indication of the potential allowability of Claim 3, Applicants have amended Claim 3 to independent form, incorporating the recitations of Claim 1, thus placing Claim 3 in condition for allowance. Applicants have amended independent Claim 1 to incorporate recitations from Claim 2, which has been canceled. Applicants have amended independent method Claim 38 along similar lines to incorporate the recitations of Claim 41, which has also been canceled. Applicants have also amended independent Claim 36 to clarify the nature of the claimed subject matter. Applicants submit that these amendments further highlight patentable distinctions between these claims and the cited U.S. Patent No. 6,889,225 to Cheng et al. (hereinafter "Cheng"). Applicants also respectfully traverse the rejections of independent Claims 13, 23, and 30, as Cheng clearly fails to disclose or suggest several of the recitations of these claims. Applicants further submit that several of the dependent claims are separately patentable. Reasons supporting patentability of the claims are discussed in detail below.

The § 112 objections

Applicants have amended Claims 4-8, 10-12, 14-22 24-29 31-35 and 37 as suggested in the Office Action, thus overcoming the objections to these claims. The objection to Claim 3 is rendered moot in view of the amendments to Claim 3, and the objections to Claims 2 and 9 are rendered moot in light of the cancellation of these claims.

The § 112 rejections

The rejection of Claim 9 is moot in view of the cancellation of Claim 9. Regarding the rejection of Claim 10, Applicants submit that support for such recitations is provided, for example, at page 47, lines 17-33, which describes index translation that uses shift factors to account for entry width to compact external memory used per CAM segment. Accordingly, Applicants respectfully request that the § 112 rejection of Claim 10 be withdrawn.

The independent claims are patentable

Each of independent Claims 1, 13, 23, 36 and 38 stand rejected as allegedly anticipated by Cheng. *See Office Action, p. 3.* As noted above, Claim 1 has been amended to incorporate to include the recitations of Claim 2, which also stands rejected as allegedly anticipated by Cheng. *See Office Action, p. 3.* Claim 1 now recites:

An integrated circuit chip comprising:

a search engine including a content addressable memory (CAM) configured to produce CAM indices responsive to search instructions provided to the search engine and an index translation circuit operatively coupled to the CAM and configured to provide translation of the CAM indices, *wherein the index translation circuit is configurable to provide independent index mappings for respective segments of the CAM.*

Thus, as explained on page 38 of the specification, the search engine is configurable to provide, for example, different index mappings (e.g., database relative, associated memory, etc.) for different databases that are stored in different segments of the CAM.

In rejecting Claim 2, the Office Action cites column 8, lines 24-41 as allegedly teaching the above-highlighted recitations. *See Office Action, p. 3.* Applicants respectfully submit that this is not the case. In particular, Cheng describes a device that includes a hash unit 222 and a content addressable memory (CAM) unit 224 that respectively provide hash outputs and CAM outputs to a logic unit 226. *See Cheng, column 7, lines 42-52.* The logic unit responsively provides an address to a memory 214 that is based on either the hash output or the CAM output depending on whether the CAM output is present. *See Cheng, column 8, lines 8-23.*

The cited passage at column 8, lines 24-41 merely indicates that the logic unit 226 may translate the hash output or the CAM output to the address space of the memory, such that, for example, hash outputs and CAM outputs are mapped to respective different portions of the memory 214. However, this does not disclose or suggest independent index mappings for respective CAM segments, as recited in amended independent Claim 1. Accordingly, Cheng does not disclose or suggest all of the recitations of amended independent Claim 1 and, for at least these reasons, Applicants submit that amended independent Claim 1 is patentable over Cheng. Applicants further submit that at least similar reasons support the patentability of amended independent Claim 38 over Cheng.

Independent Claim 36, which also stands rejected as allegedly anticipated by Cheng, has been amended to further highlight distinctions with respect to Cheng, and now recites:

An integrated circuit chip comprising:

a search engine comprising a content addressable memory (CAM) comprising a plurality of segments and configured to produce CAM indices responsive to search instructions provided to the search engine and an index translation circuit operatively coupled to the CAM and *configurable to map CAM indices for at least one of the CAM segments to addresses in a memory space external to the chip and to map CAM indices for at least one other one of the CAM segments to an address space other than the external memory space.*

Thus, for example, a chip as recited in amended independent Claim 36 may provide external memory address mapping for one CAM segment while providing, for example, database relative mapping for another CAM segment, as explained on page 38 of the present application. Such recitations are neither disclosed nor suggested by the description of the device illustrated in Fig. 4 of Cheng. For at least these reasons, Applicants submit that amended independent Claim 36 is patentable over Cheng.

Applicants respectfully traverse the rejections of the other independent claims. Independent Claim 13, which stands rejected as allegedly anticipated by Cheng, recites:

An integrated circuit chip comprising:
a search engine including a content addressable memory (CAM) *configurable to store a plurality of databases* and operative to produce CAM indices in an index space of a search machine comprising the search engine responsive to search instructions provided to the search engine and an index translation circuit operatively coupled to the CAM and configured to translate the CAM indices produced by the CAM to *database relative indices.*

In rejecting Claim 13, the Office Action cites the description of Fig. 4 of Cheng at columns 7 and 8. See Office Action, p. 3. Respectfully, there is nothing in this description that discloses or suggests "a content addressable memory (CAM) configurable to store a plurality of databases" or translation of CAM indices to "database relative indices," as these passages are devoid of any description of multiple databases in the CAM 224. Accordingly, Applicants submit that Cheng does not disclose or suggest the recitations of independent Claim 13 and, for at least these reasons, Applicants submit that independent Claim 13 is patentable over Cheng.

Independent Claim 23, which also stands rejected as allegedly anticipated by Cheng, recites:

An integrated circuit chip comprising:
a search engine including a content addressable memory (CAM) and a programmable index translation circuit operatively coupled to the CAM and ***configurable to provide a plurality of different index translations.***

In rejecting Claim 23, the Office Action cites the same passages from columns 7 and 8 cited in rejecting Claims 1 and 13. *See* Office Action, p. 3. As discussed above, these passages, in particular the passage at column 8, lines 24-41, merely indicate that the logic unit 226 provides *an* index translation, but do not disclose or suggest that the device is "configurable to provide a plurality of different index translations." Accordingly, Applicants submit that Cheng does not disclose or suggest all of the recitations of independent Claim 23 and, for at least these reasons, Applicants submit that independent Claim 23 is patentable over Cheng.

Independent Claim 30, which also stands rejected as allegedly anticipated by Cheng, recites:

An integrated circuit chip comprising:
a search engine comprising a content addressable memory (CAM) configured to produce CAM indices responsive to search instructions provided to the search engine and an index translation circuit operatively coupled to the CAM and ***configured to store memory entry size information and to provide translation of the CAM indices to another memory space based on the stored memory entry size information.***

In rejecting Claim 30, the Office Action cites the same material from Cheng cited in rejecting Claims 1, 13, and 23. *See* Office Action, p. 3. Respectfully, there simply is no disclosure or suggestion in the cited passages from columns 7 and 8 of Cheng of anything to do with storing "memory entry size information" or translation of CAM indices "based on the stored memory size information." Accordingly, Applicants submit that Cheng does not disclose or suggest the recitations of independent Claim 30 and, for at least these reasons, Applicants submit that independent Claim 30 is patentable over Cheng.

Claim 3, amended to independent form as discussed above, is patentable as indicated by the Office Action.

The dependent claims are patentable

Applicants submit that dependent Claims 4-8, 10-12, 14-22, 24-29, 31-35, 37, 39 and 40 are patentable at least by virtue of the patentability of the respective ones of independent Claims 1, 13, 23, 30, 36 and 38 from which they depend. Applicants further submit that several of the dependent claims are separately patentable.

For example, Claim 4 recites "wherein the index translation circuit is configurable to provide independent index mappings for respective databases." The Office Action cites column 8, lines 24-31 as providing such teachings but, as noted above, this passage is devoid of any description of databases, much less independent index mappings for respective databases. For at least these reasons, Applicants submit that Claim 4 is separately patentable. Applicants further submit that Claim 6, which recites "wherein the index translation circuit is configurable to provide translation of absolute indices associated with a search machine comprising the search engine to *database relative indices* and memory addresses," is separately patentable of Cheng for at least similar reasons.

Claim 7 recites "wherein the memory addresses are memory addresses in a memory space associated with a command source for the search engine." The Office Action again cites column 8, lines 24-31 as allegedly providing such teachings (see Office Action, p. 4), but there is nothing in this passage relating to "a command source for the search engine." For at least these reasons, Applicants submit that Claim 7 is separately patentable over Cheng.

Claim 11 recites:

... wherein the index translation circuit comprises a mapping table operative to associate respective combinations of a shift factor and a base address for a database with respective CAM segment identifiers, wherein the shift factors indicate database entry size, and wherein the index translation circuit is operative to receive a CAM index, to identify a base address and a shift factor corresponding to a CAM segment identifier in the received CAM index, to concatenate the identified base address with a segment entry offset in the received CAM index, and to shift the concatenated result according to the identified shift factor to produce a database relative index corresponding to the received CAM index.

In rejecting Claim 11, the Office Action cites column 6, lines 55-67 of Cheng. See Office Action, p. 4. This passage describes FIG. 3, which illustrates a hash pointer unit 110 that converts a hash address to a pointer to a memory 114. There is nothing in this passage relating to CAMs or CAM segments, much less anything disclosing or suggesting "a mapping

table operative to associate respective combinations of a shift factor and a base address for a database with respective CAM segment identifiers," "shift factors [that] indicate database entry size" or an index translation circuit "operative to receive a CAM index, to identify a base address and a shift factor corresponding to a CAM segment identifier in the received CAM index, to concatenate the identified base address with a segment entry offset in the received CAM index, and to shift the concatenated result according to the identified shift factor to produce a database relative index corresponding to the received CAM index." Accordingly, Applicants submit that Cheng does not disclose or suggest several of the detailed recitations of Claim 11 and, for at least these reasons, Claim 11 is separately patentable over Cheng. Similar reasons support the separate patentability of Claims 12, 21, 22, 28, 29, 33 and 35, as Cheng similarly fails to disclose or suggest several of the detailed recitations of these claims.

Claim 14 recites "wherein the index translation circuit is configurable to provide independent index mappings for respective segments of the CAM." Applicants submit that these recitations are separately patentable for at least similar reasons to those supporting the patentability of amended independent Claim 1.

Claim 16 recites "wherein the index translation circuit is configured to receive CAM indices from a second search machine device and operative to translate the received CAM indices to database relative indices." In rejecting Claim 16, the Office Action again cites column 8, lines 24-31. *See* Office Action, p. 4. Respectfully, there is nothing in this passage about an index translation circuit "configured to receive CAM indices from a second search machine device" or "database relative indexes." For at least these reasons, Applicants submit that Claim 16 is separately patentable.

Claim 18 recites "wherein the index translation circuit is configurable to provide database relative indices or memory addresses on a segment-by-segment basis." In rejecting Claim 18, the Office Action cites column 8, lines 24-41. *See* Office Action, p. 3. As noted above, there is nothing in this passage relating to CAM segmentation or database relative indexes and, therefore, Applicants submit that this passage simply does not disclose or suggest the recitations of Claim 18. Accordingly, Applicants submit that Claim 18 is separately patentable.

Claim 24 recites "wherein the index translation circuit comprises a programmable mapping table configurable to provide a plurality of index translations." The Office Action alleges that such recitations are taught at column 8, lines 24-41. *See* Office Action, p. 3. Respectfully, there is nothing in this passage relating to a "programmable mapping table" that provides the recited functions. For at least these reasons, Applicants submit that Claim 24 is separately patentable.

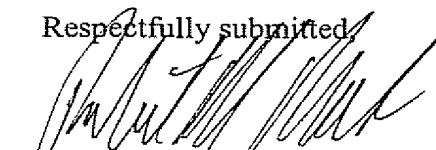
Claim 26 recites "wherein the mapping table is configurable to provide respective index mappings for respective CAM segments." The cited passage from column 8, lines 24-41 cited in rejecting Claim 26 (*see* Office Action, p. 3) is devoid of any discussion of CAM segments and, therefore, simply does not disclose or suggest the recitations of Claim 26. This passage, also cited in rejecting Claim 27 (*see* Office Action, p. 3), also does not disclose or suggest "wherein the mapping table is configurable to provide respective index mappings for respective databases" as recited in Claim 27. For at least these reasons, Applicants submit that Claims 26 and 27 are separately patentable.

Claim 31 recites "wherein the memory entry size information comprises entry size information for a database in the CAM." The Office Action cites column 6, lines 55-67 as providing such teachings. *See* Office Action, p. 4. However, as noted above, this passage has nothing to do with CAMs, much less "entry size information for a database in the CAM." For at least these reasons, Applicants submit that Claim 31 is separately patentable.

Conclusion

As all of the claims are now in condition for allowance, Applicants respectfully request allowance of the claims and passing of the application to issue in due course.

Applicants urge the Examiner to contact Applicants' undersigned representative at (919) 854-1400 to resolve any remaining formal issues.

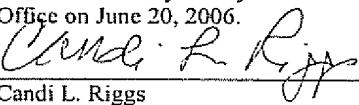
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